

Notice of Allowability

Application No.

09/338,176

Examiner

Allen Wong

Applicant(s)

SHUM ET AL.

Art Unit

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to appeal brief filed 10/10/07.
2. ☒ The allowed claim(s) is/are 1,2,4-9,11-16,18-37, renumbered as claims 1-34.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

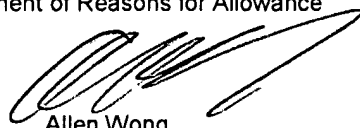
Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____


Allen Wong
Primary Examiner
Art Unit 2621

DETAILED ACTION

Allowable Subject Matter

1. Claims 1, 2, 4-9, 11-16 and 18-37 are allowed.
2. The following is an examiner's statement of reasons for allowance: The prior art does not specifically disclose the combination of limitations of claim 1: a method of recovering a three-dimensional scene from two-dimensional images, the method comprising: providing a sequence of frames; dividing the sequence of frames into frame segments wherein the frames in the sequence comprise feature points and wherein the sequence of frames is divided into frame segments based upon frames in each frame segment having at least a minimum number of feature points being tracked to at least one base frame in the frame segment; performing three-dimensional reconstruction individually for each frame segment derived by dividing the sequence of frames; and combining the three-dimensional reconstructed segments together to recover a three-dimensional scene for the sequence of images.

The prior art does not specifically disclose the combination of limitations of claim 9: a method of recovering a three-dimensional scene from two-dimensional images, the method comprising: identifying a sequence of two-dimensional frames that include two-dimensional images; dividing the sequence of frames into segments, wherein a segment includes a plurality of frames and wherein dividing includes: identifying a base frame, identifying feature points in the base frame; and determining the segments such that every frame in a segment has at least a predetermined percentage of feature points identified in the base frame; for each segment, encoding the frames in the segment into

at least two virtual frames that include a three-dimensional structure for the segment and an uncertainty associated with the segment and wherein encoding includes choosing at least two frames in the segment that are at least a threshold number of frames apart; for each of the at least two chosen frames, projecting a plurality of three-dimensional points into a corresponding virtual frame; and for each of the at least two chosen frames, projecting an uncertainty into the corresponding virtual frame. Claim 23 is patentable for at least similar reasons as claim 9.

The prior art does not specifically disclose the combination of limitations of claim 31: a method of recovering a three-dimensional scene from a sequence of two-dimensional frames, an improvement comprising dividing a long sequence of frames into segments and reducing the number of frames in each segment by representing the segments using between two and five representative frames per segment, wherein the representative frames are used to recover the three-dimensional scene and remaining frames are discarded so that the three-dimensional scene is effectively compressed, wherein dividing the long sequence into segments includes identifying a base frame and tracking feature points between frames in the sequence and the base frame and ending a segment whenever a frame does not contain a predetermined threshold of feature points that are contained in the base frame.

The prior art does not specifically disclose the combination of limitations of claim 37: an apparatus for recovering a three-dimensional scene from a sequence of two-dimensional frames by segmenting the frames, comprising: means for capturing two-dimensional images; means for dividing the sequence into segments; means for

calculating a partial model for each segment that includes three- dimensional coordinates and camera pose for features within the frames of the segment, the three-dimensional coordinates and camera pose being derived from the frames of the segment; means for extracting virtual key frames from each partial model; and means for bundle adjusting the virtual key frames to obtain a complete three- dimensional reconstruction of the two-dimensional frames. Claim 36 is patentable for at least similar reasons as claim 37.

See the applicant's remarks on pages 7-31 of the appeal brief filed 10/10/07 for further explanation of the reasons of patentability for claims 1, 9, 23, 31, 36 and 37.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact Information

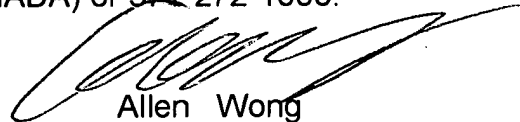
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen Wong whose telephone number is (571) 272-7341. The examiner can normally be reached on Mondays to Thursdays from 8am-6pm Flextime.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John W. Miller can be reached on (571) 272-7353. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Allen Wong
Primary Examiner
Art Unit 2621

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